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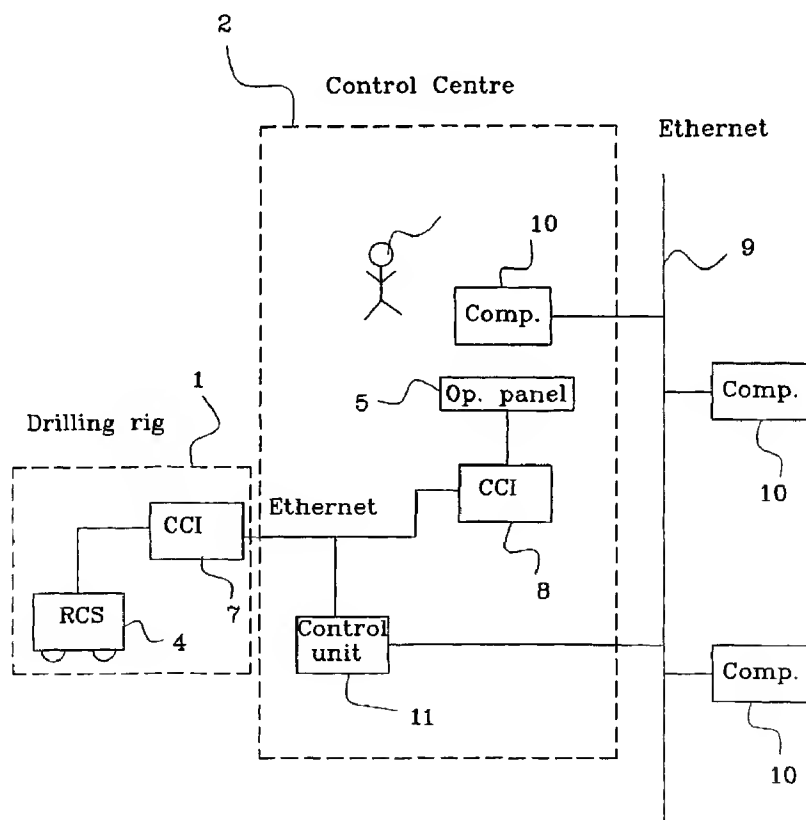
(57) Abrégé/Abstract:

The present invention relates to a system for remote control of drilling rigs, where the remote control is performed in a from the drilling rig (1) remotely located control centre (2). The system is arranged to utilise a standardised data communication method for communication between the remotely located control centre (2) and the drilling rig (1). The system further includes a control unit (11) arranged to control the data communication between the remotely located control centre (2) and the drilling rig (1), and other traffic within the network. The invention also relates to such a control unit (11).

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(54) Title: REMOTE CONTROL OF DRILLING RIGS
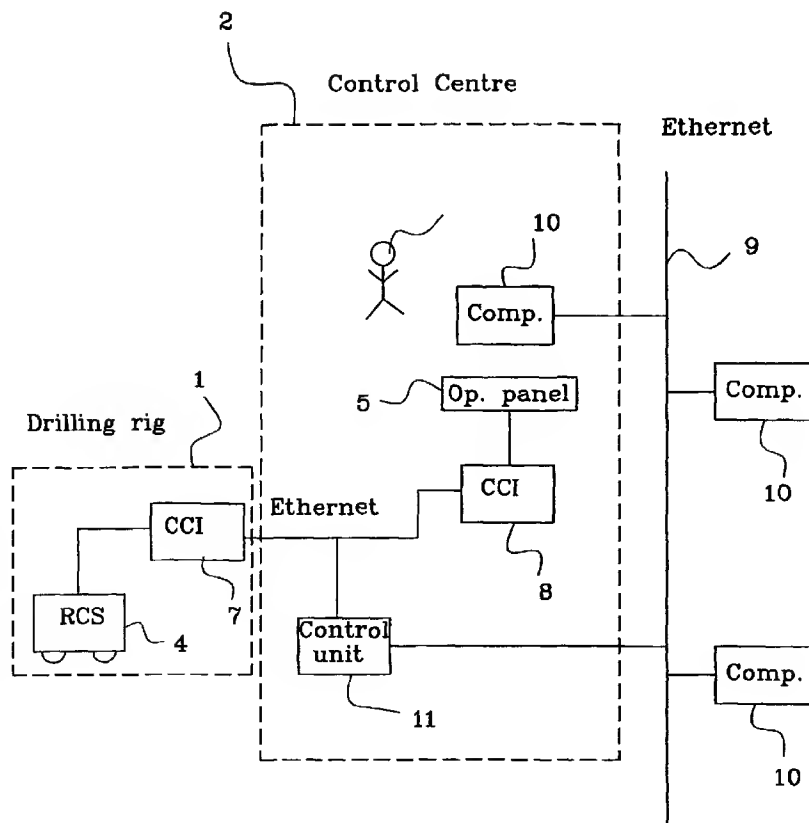
(57) Abstract: The present invention relates to a system for remote control of drilling rigs, where the remote control is performed in a from the drilling rig (1) remotely located control centre (2). The system is arranged to utilise a standardised data communication method for communication between the remotely located control centre (2) and the drilling rig (1). The system further includes a control unit (11) arranged to control the data communication between the remotely located control centre (2) and the drilling rig (1), and other traffic within the network. The invention also relates to such a control unit (11).

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For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

Remote control of drilling rigs

Field of the invention

The invention relates to a system for enabling remote control
of drilling rigs of the kind defined in the preamble of claim
5   1.

Background of the invention

It is more and more common to control drilling rigs remotely,
since the drilling rigs are becoming more automated. The
operator, or person responsible for the operation of the

10   drilling rig, is more or less just supervising the drilling
rig, and he or she takes action only when needed, for example
when a failure has occurred. Therefore it is rational and
suitable to assemble the operators at the same place, for
example in a control centre in or in relation to the mine. All

15   the required surveillance and monitoring of the drilling rigs,
and also some elementary and common operations, are thus
performed in the control centre by means of remote control.

When implementing remote control of drilling rigs a vital
consideration is to ensure reliable communication. A control

20   command sent by the operator of the drilling rig has to arrive
at the drilling rig in time. Conversely, messages such as an
alarm or a warning from the drilling rig to the operator has
to be delivered promptly.

One presently known system, used in drilling rigs for enabling

25   remote control, is the PROFIBUS® system, available from
Siemens. PROFIBUS® is a bus system for carrying out
communication in small cell networks and in field devices.

There are however several disadvantages with the known
systems. One disadvantage is that, PROFIBUS®, for example, is

30   a more specialised technique than what would be desired.

Further yet, in the PROFIBUS® system the network for remote control of a drilling rig is a separate network, which fact makes this technique quite expensive to employ. The network used for remote control is thus isolated from other networks.

5   Thus there exists a need to provide a system in which a simple, non-expensive and preferably standardised method for data communication is used, enabling an inexpensive and easily implemented way to carry out remote control of drilling rigs, which system further ensures a safe communication of data.

10   **Summary of the invention**

It is an object of the present invention to provide a system for remote control of drilling rigs that solves the above mentioned problems. In particular it is an object of the present invention to provide a system for enabling remote

15   control of drilling rigs in a safe manner.

These objects are achieved, according to a first aspect of the invention, by a system for remote control of drilling rigs as claimed in claim 1.

The present invention provides an inexpensive way to implement

20   remote control of drilling rigs, where an existing infrastructure may be employed. The operator of the drilling rig, and other users with access to the drilling rig, or with access to information retrieval from the drilling rig, may share the capacity available within the network, thus avoiding

25   the need of a separate network for the remote control of a drilling rig. The safe operation of the drilling rig is ensured by a control unit, which functions to block or prioritise traffic in accordance with urgency or priority of different kinds of traffic.

The system in accordance with the present invention includes a
control unit that is arranged to control the data
communication between the remotely located control centre and
the drilling rig, as well as other traffic directed to and/or
5   from the remotely located control centre and to and/or from
the drilling rig. Thereby a safe operation of the drilling rig
is ensured in that it is made sure that crucial data is
delivered correctly and in time.

In accordance with another embodiment of the invention, the
10   control unit is arranged to prioritise traffic between the
remotely located control centre and the drilling rig. This
provides a system which does not need to be isolated from
networks other than the network used for enabling remote
control of the drilling rig. Instead different traffic may be
15   mixed and sent when there is enough capacity available in the
network. Again, this provides a system that is easily
implemented, for example in an existing infrastructure.

In accordance with another embodiment of the invention the
control unit is arranged to deny other traffic when there is
20   traffic between the remotely located control centre and the
drilling rig. This feature provides a supplementary security
measure by denying all traffic except the traffic between the
remotely located control centre and the drilling rig. The
total capacity of the network is thus assigned to this
25   particular communication, thereby ensuring the data
transmission. Further, the network may be properly
dimensioned, so as to not provide for excess capacity.

In accordance with one embodiment of the system for remote
control of drilling rigs the system is arranged to utilise a
30   standardised data communication method for communication
between the remotely located control centre and the drilling

rig. This gives a system that is easily implemented, for example in an existing infrastructure. Further, utilising a standardised data communication method for communication between the remotely located control centre and the drilling
5   rig provides an inexpensive and simple way to implement remote control of drilling rigs.

In accordance with another embodiment of the invention the standardised data communication method is a method commonly used within computer environments. For example, one of the
10 following methods could be used: Ethernet or Token ring. These are well known methods and provide an inexpensive way to implement remote control of drilling rigs.

In accordance with another embodiment of the invention the system for remote control of drilling rigs is connected to
15 other networks utilising the same standardised technique for data communication. This gives a simple and non-expensive way to interconnect the drilling rig and control centre to, for example, an office or support centre.

In accordance with another embodiment of the invention the
20 control unit gives priority to control commands over other traffic between the remotely located control centre and the drilling rig. If the traffic between the remotely located control centre and the drilling rig comprises additional traffic besides control commands, this feature ensures that
25 critical information is prioritised.

The additional traffic between the remotely located control centre and the drilling rig could for example comprise image and/or sound data relating to the drilling rig, and recorded by a camera and/or a microphone. This additional traffic
30 provides a convenient way to supervise the drilling rig, while

giving the option to exclude such data, or give such data low priority, if there is other, more critical data in need to be transmitted.

In accordance with another embodiment of the invention the
5   control unit is a server. The control unit being a server provides a simple and convenient way to implement the traffic controlling. The server can easily be updated, and could be installed on any commercially available computer.

The invention is also related to a control unit for
10   controlling the traffic within a system for remote control of drilling rigs. Advantages similar to the above described are achieved with such a control unit. Further advantages achieved by the present invention will become clear in the following description.

15   **Brief description of the drawings**
Fig. 1 shows the system including the inventive control unit for controlling traffic within the system in accordance with the present invention.

Detailed description of preferred embodiments
20   In order to obtain a better understanding of the present invention, a brief description of Ethernet, which is used in the preferred embodiment of the present invention, is described. However, it is to be understood that other methods for communicating data may be used as well. Ethernet
25   (specified in IEEE 802.3) is a common method for data communication, used for example in a local area network (LAN) or a VLAN (Virtual LAN) and is now recognised as an industry standard. It is thus a highly standardised technique, and frequently used in different computer environments, such as
30   offices. In accordance with the Ethernet technique, a computer

wishing to transmit data first checks whether the network has
capacity available for the transmission. If the network does
not have the capacity to transmit the desired data, the
computer waits a specified amount of time, after which it

5   again tries to transmit the data. The data is broken into
packets and each packet is transmitted using a CSMA/CD
(Carrier Sense Multiple Access/Collision Detect) algorithm
until it arrives at the destination without colliding with any
other packet. The bandwidth for an Ethernet network is about

10 10 Mbit/s, and higher data rates are possible, for example in
fast Ethernet and gigabit Ethernet.

With reference to Fig. 1, a system showing the present
invention is depicted. In accordance with the present
invention, the Ethernet technique is used in order to

15 communicate data, such as control information, between the
operator and the drilling rig. As mentioned above, Ethernet is
a standardised method, and is today used in many office
environments, for example, and the protocol used is the
likewise standardised TCP/IP (Transmission Control

20 Protocol/Internet Protocol). It is thus a very commonly used
method for communicating data and also a relatively
inexpensive one. In accordance with the invention, the
Ethernet technique is used in order to accomplish remote
control of drilling rigs. The existing infrastructure may thus

25 be used, providing a simple and easily implemented way to
accomplish remote control of drilling rigs, and the same data
communication method being utilised within the whole system.

A computer 4, RCS (Rig Control System), is provided in the
drilling rig 1 controlling the operations of the drilling rig

30 1. This computer 4 ensures a secure and reliable functioning
of the remote control of the drilling rig 1. A CAN (Controller

Area Network) bus (not shown) is preferably used for the
transfer of data between the computer RCS 4 and an interface
CCI 7 (Common Communication Interface). A CAN bus is a two
wire serial bus, suitable for use in particularly exposed

5   environments, for example in noisy environments comprising
considerable interference. The computer 4 is in turn connected
to a signal converter, or an interface CCI 7, able to handle
Ethernet communication. The CCI interface 7 converts the data
from the CAN bus into a format usable within the Ethernet

10   network. The control centre 2, from where an operator 3
controls the drilling rig 1, is also provided with a CCI
interface 8, where the data is converted back to a CAN bus
traffic format, and provided to the operator 3 by means of an
operator panel 5, or navigation panel. This second conversion

15   is performed since the CAN bus is preferably used in the
control centre 2 as well. The operator 3 is thus able to
operate the drilling rig 1 properly by giving control commands
in a CAN bus format. These control commands are then
transferred by means of Ethernet after said conversion. In the

20   same way data, such as control commands, entered by the
operator 3 is converted by the CCI interface 8 to a format
usable within the Ethernet network, and then converted by the
CCI interface 7 to a CAN bus traffic format.

Expressed differently, the CCI interface 7 is a signal

25   converter listening to the traffic on the CAN bus. The CCI
interface 7 converts data intended to the control centre 2, or
to another destination within the system, to a format that can
be transmitted by means of a standardised data communication
method, such as Ethernet.

30   When using Ethernet, as shown in Fig. 1, it is easy to
interconnect the network for remotely controlling a drilling

rig 1 to other networks, as is also shown in the figure, and
as will now be described. As explained above, a computer in a
network utilising Ethernet and wishing to transmit data first
checks whether the network has capacity available for the

5   transmission. If the network does not have capacity to
transmit the desired data, the computer waits a predetermined
amount of time, after which time it again tries to transmit
the data. When transmitting critical data, such as alarms or
control commands, between the control centre 2 and the

10   drilling rig 1, it is of course not applicable to wait for
capacity to be available within the network. This problem is
solved by means of a control unit 11 in accordance with the
present invention, which is described below.

The drilling rig 1 is controlled and supervised by an operator

15   3 in a control centre 2, located remotely from the drilling
rig 1. It is, as mentioned above, crucial that control
commands and other data sent from the operator 3 to the
drilling rig 1 is indeed transmitted, is transmitted in a
secure manner, and it is in most cases important that the data

20   is transmitted immediately without any delays. Likewise, it is
important that the operator 3 receives information sent from
the drilling rig 1 in a safe manner, information such as
alarms and warnings. In accordance with the present invention
a control unit 11 is provided for controlling the traffic

25   between the drilling rig 1 and the control centre 2, and also
for controlling other traffic occurring within the network, if
any. Accordingly, a network 9, such as an office environment
or a support centre, including one or more computers 10 may
communicate data to and from the control centre 2 and to and

30   from the drilling rig 1. This data may include, but is not
limited to, log information, operating characteristics,
operating information, failure reports etc. The network uses

the same communication method as the network for remotely
controlling the drilling rig 1, in the preferred embodiment
Ethernet technique, and can thus easily be connected to it.

The control unit 11 may for example be a server, and the
5   control unit 11 is arranged to control the data communication,
or traffic, between the different computers 10, and the
drilling rig 1. One important function performed by the
control unit 11 is to ensure capacity for the communication
between the control centre 2 and the drilling rig 1. In
10   accordance with the present invention this function can be
accomplished in a number of different ways.

The control unit 11 may block all other traffic occurring
within the network when there is a need for a critical data
communication. That is, traffic other than data between the
15   control centre 2 and the drilling rig 1 is blocked in its
entirety, when there is a need for data communication there
between. Thus a person working at the office and wishing to
retrieve for example run statistics from a certain drilling
rig 1 is not allowed to retrieve the desired information if
20   there is, or will soon be, a data communication between the
drilling rig 1 and the control centre 2. Thus a secure
operation of the drilling rig 1 is ensured.

Alternatively, the control unit 11 may give different
priorities to different kinds of data. For example, control
25   commands sent from an operator 3 is always prioritised over
all other kinds of traffic. Thus the operation of the drilling
rig 1 is guaranteed. In the same way, data from the drilling
rig 1 may be given priority over other traffic, ensuring that
the operator 3 receives failure reports, alarms and warnings
30   etc. The data communicated within the system may thus be
mixed, that is, data critical for the operation of the

drilling rig 1 may be mixed with data non-critical to the
operation. The need for a separate network for the remote
control of a drilling rig 1 is thus eliminated.

The drilling rig 1 may be provided with a camera (not shown)
5   and/or a microphone (not shown) for enabling a convenient
supervision means. The information from the camera and/or
microphone may be given a certain priority, for example a
lower priority than control commands to the drilling rig 1 and
lower priority than alarms from the drilling rig 1, but higher
10   priority than information transmitted from a computer 10 not
located at the control centre 2. The control unit 11 may be
pre-programmed to give a certain priority to a certain kind of
traffic, or this priority may be included in the transmitted
data.

15   In accordance with the present invention, a simplified and
inexpensive solution for implementing remote control of
drilling rigs 1 is provided. Since the same network, or method
for transmitting data, is used throughout the system, the use
of a same interface, regardless of the working station or
20   location of the working station, may easily be implemented.
That is, the operator 3 of the drilling rig 1 located in the
control centre 2 uses the same interface, or MMI (Man Machine
Interface), as a person working at an ordinary personal
computer in an office. This has the advantage of providing the
25   users with a familiar and uniform interface. Further, it is
more convenient and cost-effective to have the same interface
throughout the system for maintenance reasons as well.

In one embodiment a standardised format is used, such as for
example HTML or XML. Thus a commonly available web browser can
30   be used, for example Internet explorer or Netscape. Further,
only subsets of the information may be shown to a specific

user. For example, if a user is only interested in failure
reports, his or her interface may be set to only show the
information of interest. The information transmitted and shown
to a specific user may also be dependent on the capacity of
5   the user's terminal. If the user only has access to a PDA
(Personal Digital Assistant) with a rather limited bandwidth,
a subset of the information may be transmitted to it.

There are several possible alterations and modifications of
the present invention. For example, it is conceivable to
10   exclude the use of a CAN bus between the drilling rig and a
CCI interface and between a CCI interface and the control
centre respectively, giving a system using Ethernet all the
way.

Further, Ethernet is the preferred data communication method
15   to be used, but other data communication methods may be used
as well, such as Token Ring or the like.

Claims

1. A system for remote control of drilling rigs (1), said
remote control being performed in a from the drilling rig (1)
remotely located control centre (2) **characterised in** that said
5   system includes a control unit (11) arranged to control the
data communication between the remotely located control centre
(2) and said drilling rig (1) as well as other traffic
occurring within the system.

2. System as claimed in claim 1, wherein said control unit
10   (11) is arranged to give priority to traffic between the
remotely located control centre (2) and the drilling rig (1).

3. System as claimed in claim 1, wherein said control unit
(11) is arranged to deny other traffic when there is traffic
between the remotely located control centre (2) and the
15   drilling rig (1).

4. System as claimed in any of the preceding claims, wherein
said system is arranged to utilise a standardised data
communication method for communication between the remotely
located control centre (2) and the drilling rig (1).

20   5. System as claimed in claim 4, wherein said system is
connected to other networks (9) utilising the same said
standardised data communication method.

6. System as claimed in claim 4 or 5, wherein said
standardised data communication method is one of the
25   following: Ethernet and Token ring.

7. System as claimed in any of the preceding claims, wherein
said control unit (11) gives priority to control commands over

other traffic between the remotely located control centre (2)
and the drilling rig (1).

8. System as claimed in claim 7, wherein said other traffic
between the remotely located control centre (2) and the
5   drilling rig (1) comprises image and/or sound data relating to
the drilling rig (1).

9. System as claimed in any of the preceding claims, wherein
said control unit (11) is a server.

10. A control unit for use in a system for remote control of
10   drilling rigs (1), said remote control being performed in a
control centre (2) remotely located from the drilling rig (1)
characterised in that said control unit (11) is arranged to
control the data communication between the remotely located
control centre (2) and the drilling rig (1) as well as other
15   traffic occurring within the system.

11. Control unit as claimed in claim 10, wherein the control
unit (11) is arranged to give priority to traffic between the
remotely located control centre (2) and the drilling rig (1).

12. Control unit as claimed in claim 10 or 11, wherein the
20   control unit (11) is arranged to deny other traffic when there
is traffic between the remotely located control centre (2) and
the drilling rig (1).

13. Control unit as claimed in any of claims 10-12, wherein
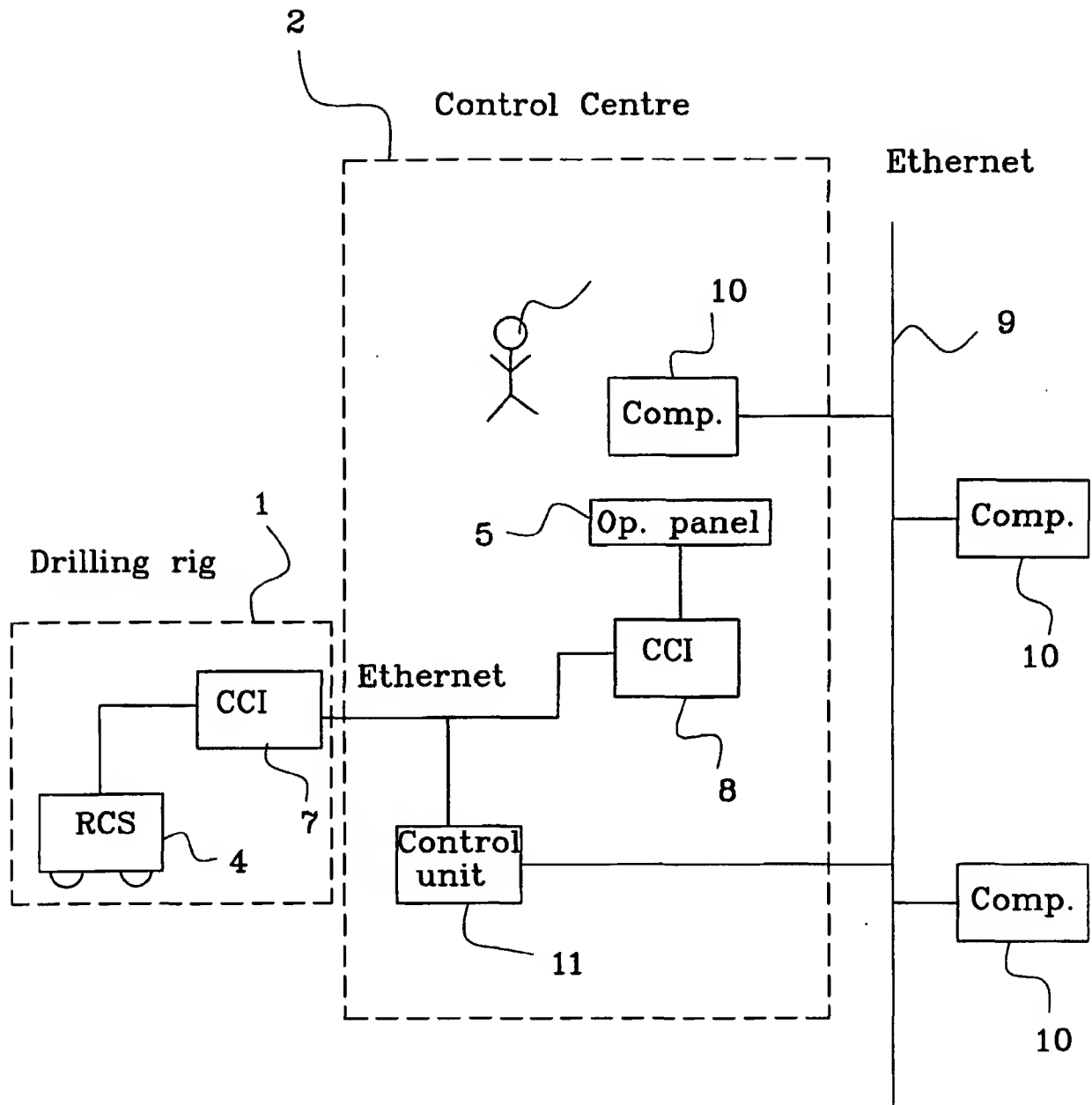said control unit (11) is a server.

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Fig. 1